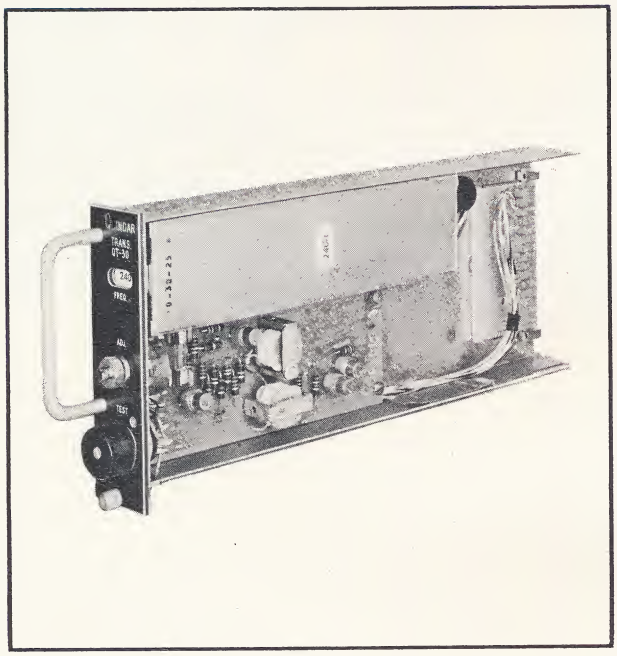
Quindar
ELECTRONICS, INC. 60 Fadem Road, Springfield, N. J. 201-379-7400

QT-30 FS TONE TRANSMITTER

Bulletin 1005



FEATURES

- One common type of plug-in transistor used throughout
- Channel spacings can be as little as 100 cps
- Front panel test socket
- Individually fused
- Screwdriver system expansion
- Interchangeability of modules
- Inexpensive, compact, lightweight
- 12 VDC operation
- Wide tolerances on input power and temperature

FUNCTION

The Quindar QT-30 is a transistorized frequency-shift transmitter designed to transmit audio tones of a specific center frequency for remote supervisory control or telemetering purposes. FS transmitters convey information by shifting the transmitted frequency over a narrow range. The QT-30 can be keyed to transmit one of three frequencies; Center, Mark or Space. Center is the nominal channel frequency, Mark is a frequency Δf higher than Center, and Space is a frequency Δf lower than Center. By means of an external jumper, the QT-30 can be adapted to transmit one of two frequencies—Mark or Space. The 3-frequency use of the QT-30 is for 3-state applications such as open-no action-close control. The 2-frequency use of the QT-30 is for 2-state applications such as transmitting 1's and 0's of a digital code.

These units can be supplied to transmit any center frequency from 365 to 6925 cps over telephone line pairs or other transmission media for subsequent detection and conversion into a functional output. They are frequently used in combination with other transmitters operating on a particular center frequency to perform many functions over the same transmission circuit. Quindar FS units are interchangeable with Quindar AM units without modification.

Typical applications of FS units are remote supervisory control of pumps, motors, valves, regulators—and telemetering of pressure, flows, levels, electrical quantities, etc. Most transmitting functions of a Centralized Dispatching System (CDS) can be handled by these units.

DESIGN HIGHLIGHTS

The QT-30 is comprised of a highly stable Hartley oscillator, a push-pull balanced amplifier and a line coupling network to filter the output and provide an impedance match to the line. The line coupling network, oscillator tank, and tuning capacitors which determine the operating frequency are enclosed in an included QO-30-XXX plug-in sub-module. The XXX designation indicates the center frequency. Either dry contact keying or voltage keying can be used.

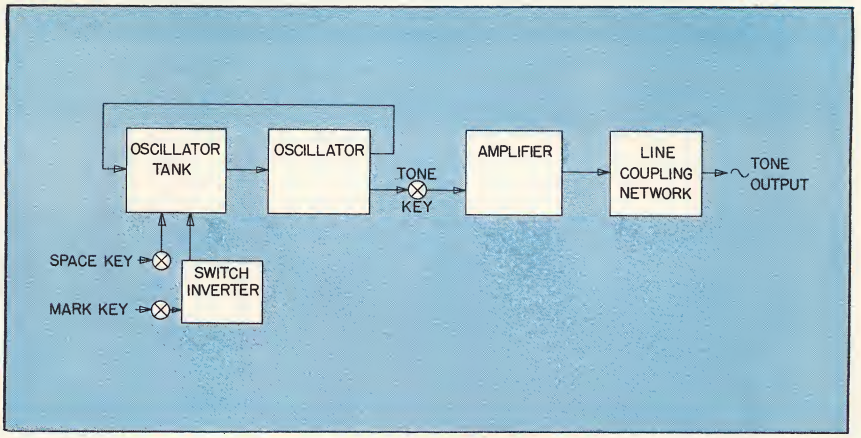
In keying the QT-30, two pairs of keying terminals are used; one keys Mark and one keys Space. Keying neither pair of terminals allows the transmitter to send the Center frequency. In keying the QT-30 for 2-frequency operation, one pair of keying terminals is used to shift the frequency to Mark. When these terminals are unkeyed the unit transmits Space. The same QT-30 can also be adapted to transmit Mark in the unkeyed condition and Space when keyed.

(Continued on Back Page)

DESIGN HIGHLIGHTS

(Continued)

All wiring is brought to the Quindar module plug which mates with a screw-type terminal block. This terminal block is furnished as a part of the QT-30 but is usually fastened to the rear of a mounting frame that houses several modules.



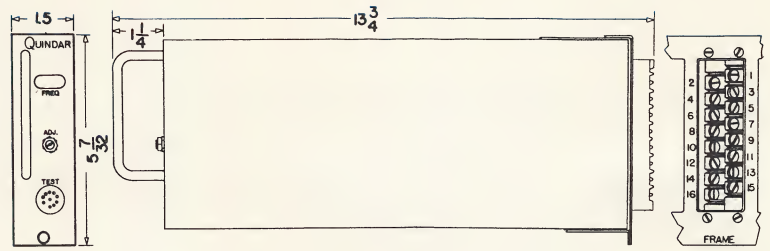
BLOCK DIAGRAM, QT-30 FS TONE TRANSMITTER

SPECIFICATIONS

Frequency Range:	365 to 6925 cps
Channel Spacing:	100 cps (365-3500) 150 cps (3625-6925) 170 cps (425-3825)
Output Level:	+5 dbm maximum, continuously adjustable
Output Impedance:	600 ohms with rising characteristics
Keying Speed:	Limited by receiver filters
Frequency Shift (Δf):	On channels for 100 cps spacing, 25 cps On channels for 150 cps spacing, 32 cps On channels for 170 cps spacing, 42 cps
Operating Temperature Range:	-30°C to +60°C
Power Required:	10.5-13.2 VDC, 16 ma on transmitting, 4 ma on standby
Weight:	2¾ lbs.

ORDERING INFORMATION

Specify QT-30 followed by the frequency at which the transmitter will operate. A unit suitable for 3-frequency operation will normally be supplied. If 2-frequency operation is desired this should be stated and if it is desired that Mark be transmitted in the unkeyed condition (rather than Space) this, too, should be noted on order. The intended channel spacing should be specified since this may affect the frequency shift (Δf) used. Note that for high speed pulsing a greater Δf is desirable. Standard frequencies can be selected from those listed in Quindar General Information Bulletin 1000.



OUTLINE DRAWING, QT-30 FS TONE TRANSMITTER

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Quindar
ELECTRONICS, INC. 60 Fadem Road, Springfield, N. J.

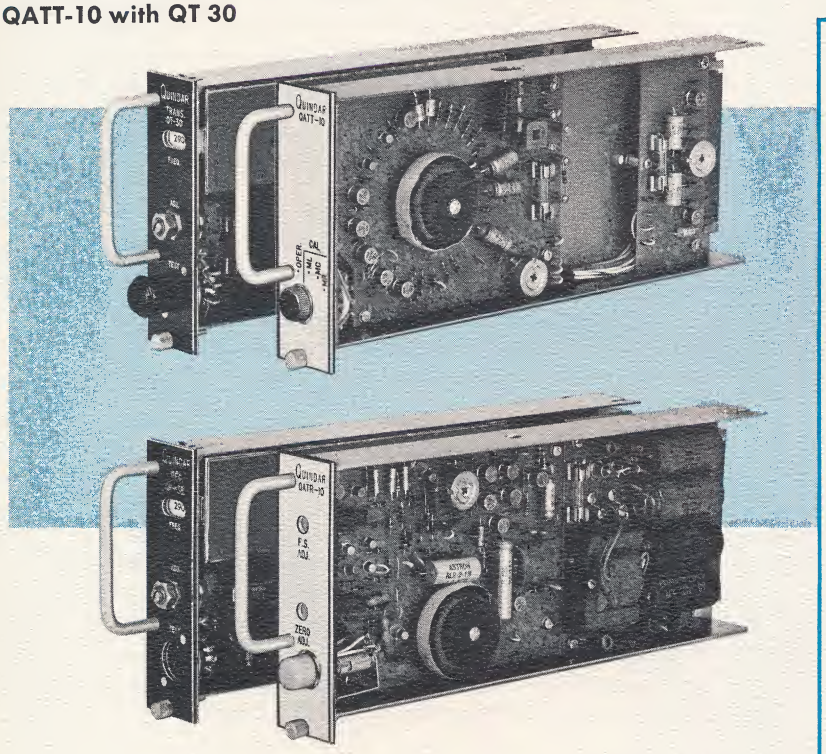
ANALOG TELEMETERING SYSTEM QATS-10
Bulletin 6000

Quindar Analog Telemetering System, QATS-10

FUNCTION

The QATS-10 is designed for accurate, remote measurement of quantities which can be converted into DC voltages or currents. By means of variable frequency modulation of an audio tone channel, accurate readings can be transmitted any distance. This form of telemetering is compatible with other forms of data transmission and may be frequency multiplexed with control and supervisory functions.

Transmit Terminal
QATT-10 with QT 30



Receive Terminal
QATR-10 with QR-30

APPLICATION

The Quindar Analog Telemetering system provides a reliable, accurate, rapid and easily maintained means of remote measurement. This all solid state system is used for the measurement, transmission and indication of such variables as current, voltage, power, pressure, flow, shaft position and many other quantities that can be transformed into a D.C. electrical signal.

As an example, the operation of electrical power systems can be substantially improved by providing the load dispatcher with accurate, up-to-date information. Better operating efficiency and lower cost can be realized by ensuring that the load dispatcher at one centralized point is informed of all the operating parameters of his system, knows the amount and direction of power flow in the tie lines, and can electronically totalize any of these measurements for any convenient points.

FEATURES

- No moving parts. Solid state amplifiers and rugged magnetic circuitry.
- Exceptionally stable magnetic circuitry in both transmitter and receiver insures long term accuracy.
- Accurate and stable over wide temperatures and supply voltage ranges.
- No power-wasting temperature controlling ovens.
- Transmitter, including tone requires only 1.2 watts; may be operated from battery.
- Unique filtering of output current gives fast response and eliminates pointer "Jitter."
- Internal calibration check; adjustments made with multiturn potentiometers; optional remote calibration check from receiving end requires addition of one tone channel.
- Built-in failure alarm. No error introduced in totalizing applications even on failure.
- Optional DC line package permits use on telegraph grade lines.
- Modular construction; small space requirement; compatible with existing Quindar equipment.

APPLICATIONS (cont'd)

The use of a variable frequency for the telemetering signal permits direct wire connection between transmitter and receiver, or operation over tone channels. The latter enables use over any distance since the modulated tones may be carried over any voice grade facility afforded by leased lines, radio, microwave, or laser beams. Up to 25 channels may be multiplexed on a 300 to 2800 cps circuit.

The output of the system can be used with a very wide range of meters, recorders, or computer circuits. The output is a current with a 5 ma span which can operate devices with impedances up to 3000 ohms. The output current is produced from a constant current type source so that variations in the display device resistance (usually highly sensitive to temperature changes) will not impair system accuracy.

DESCRIPTION

The QATS-10 utilizes a variable frequency signal which can be changed from 5 cps to 25 cps proportionally to changes in a d.c. voltage or current at the input to the transmitter. The system output is a current directly proportional to the input signal.

The QATT-10, telemeter transmitter block diagram is shown in Figure 1. It consists of an input strapping arrangement to permit either a voltage or current input, a voltage to frequency converter, and a voltage regulator.

The voltage to frequency converter is a d.c. amplifier and transformer coupled multivibrator. The transformer uses a magnetic core having a square hysteresis loop. In this type of circuit the frequency of oscillation is dependent on applied voltage and on a constant determined by the characteristics of the core rather than the characteristics of the multivibrator circuit. The core characteristics are more uniform, stable, and compensable than the circuit characteristics. This arrangement requires no ovens for temperature stability and draws very little power.

The QATR-10, telemeter receiver block diagram is shown in Figure 2. It consists of an input pulse reshaper and regenerator, integrating filter, voltage to current converter and constant current reference source. By generating constant energy pulses at a rate controlled by the incoming frequency and then integrating, a voltage is obtained which is directly proportional to frequency. The composite circuitry for incoming pulse regeneration, again depends on the use of a square loop saturable core transformer similar to that used in the transmitter. Constant voltage pulses are applied to this transformer which then generates constant amplitude and duration pulses. The frequency of the pulses is controlled by the incoming frequency without regard for incoming signal duration or distortion.

The integrating filter is a carefully designed device in which charge and discharge times are closely controlled. This is extremely important in preserving direct linearity between input frequency and output voltage. The smoothed voltage is then applied to the voltage to current converter to provide a proportional output current of higher power. The output is from a high impedence constant current type source.

The constant current reference source provides bias current for adjusting the zero point, for example, to mid-scale. It also provides currents for calibrating the system. Special zero temperature coefficient reference sources are used for this purpose rather than Zener diodes, mercury cells or other common and less expensive standards.

ADDITIONAL FEATURES

The telemeter receiver is equipped with an alarm light and alarm relay. The lamp on the front panel of the QATR is normally ON and goes OFF if the receiver fails to receive a proper signal. Simultaneously, the alarm relay operates, which opens the output circuit. In this way, no erroneous currents will be included in a totalized reading. Auxiliary alarm contacts are also provided.

The filtered output causes virtually no meter jitter which would otherwise impair the readability and accuracy. This low jitter is coupled with one second response.

Broad tolerance to all environmental and operational conditions. Operates over −20 to +60° C up to 95% humidity, with −5% + 10% variation in supply voltages. This system can accept up to 40% bias distortion in the signal to the receiver. All units are moisture and fungus proofed. Protection is included at the transmitter to prevent damage should the input exceed a normal value.

Calibration is extremely convenient. All normal adjustments for calibration exist at the receive station. Multiturn pots are used to give better control. A simple switch for meter left, center, and right is provided on the front of the transmitter. Provisions are included to permit remote calibration by means of the relay output of a tone receiver operated from the dispatcher's location.

PHYSICAL

The QATT-10 is contained in a single standard Quindar module as is the QATR-10. Mounting arrangements are completely compatible with Quindar tone equipment. A complete terminal including power supply, QATT-10, and tone transmitter can be mounted in a QX-3, 1¾″ x 19″ frame. Similarly, a power supply, QATR-10, and tone receiver also can be mounted in the QX-3. Five combinations of tone transmitter and QATT-10 or tone receiver and QATR-10 can be mounted in the QX-11 Frame, 5¼″ x 19″.

All user connections are available on screw type barrier terminal blocks on the rear of each module.

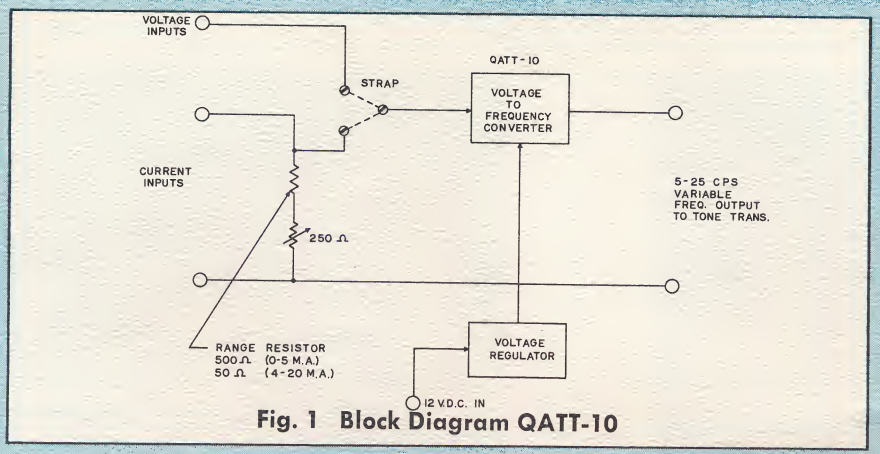


Fig. 1 Block Diagram QATT-10

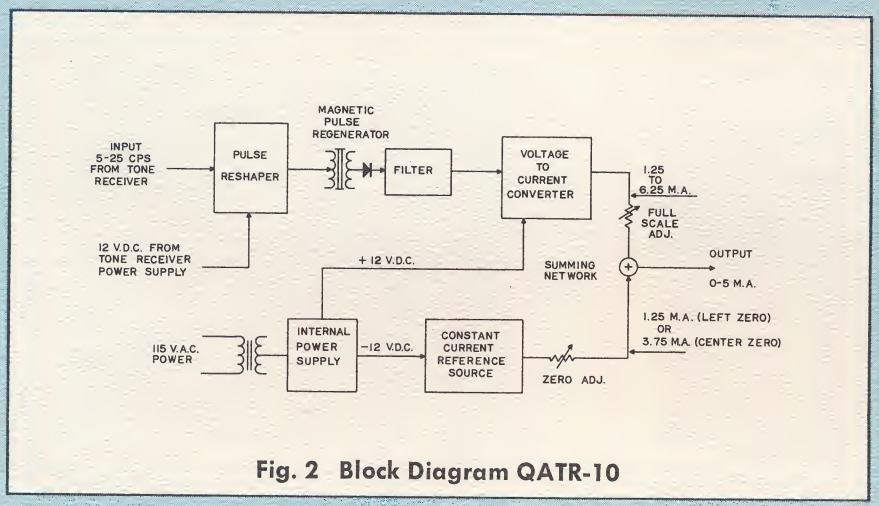
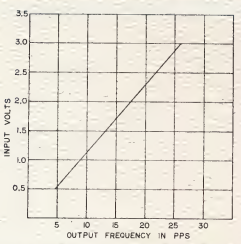
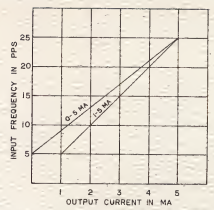


Fig. 2 Block Diagram QATR-10

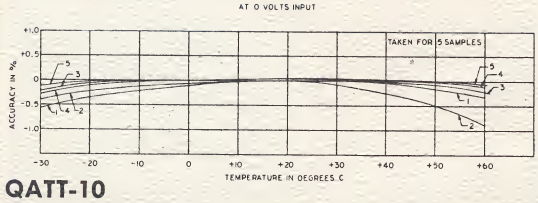
TYPICAL CHARACTERISTICS



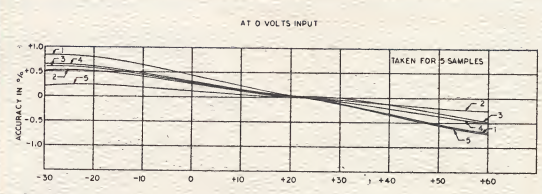
Input DC vs Frequency



Input Frequency vs Output I



QATT-10
Accuracy* vs Temperature



QATR-10
Accuracy* vs Temperature

*Accuracy is TOTAL SYSTEM accuracy with one terminal subjected to the complete temperature range and the other held at room temperature.

SPECIFICATIONS

QATT-10

Transmitter Input

Current ranges of 0-5 or 4-20 ma. Voltage range of 2.4 volts full scale (higher ranges with divider network)

Transmitter Input Impedances

Voltage input: 100 K ohms minimum

[redacted] balanced

[redacted]

Current input:

0-5 ma range: 500 ohms

4-20 ma. range: 125 ohms

Transmitter Output

Frequency: 5-25 cps square wave

Accuracy: ± 0.3% maximum error including receiver. 1% of full scale maximum error for any combination of temperature in the range of —30° to +60°C or supply voltage —5% +10%.

Environmental Range:

Temperature: —30°C to +60°C

Humidity: up to 95%

Power Requirement:

12 —5% + 10% volts DC, at 80 ma

Weight:

2¼ pounds

ORDERING INFORMATION

The QATS-10 includes the QATT-10 telemetering transmitter and QATR-10 telemetering receiver. It does not include power supplies, tone equipment and frames. These must be ordered separately. For the QATT-10, if 12 VDC is not available and the equipment is to operate from 115 VAC, order the QP-3 for up to three QATT-10 plus tone combinations and the QP-15 for up to fifteen. For the QATR-10, 115 VAC is necessary; the QP-15 can handle up to 7 combinations of QATR-10 plus tone. For selection of tone frequencies see Bulletins 1000A. Mounting frames are described in Bulletin 1001A.

The normally supplied systems use a variable frequency of 5-25 cps.

QATR-10

Receiver Input

Signal Required: 10 volts peak to peak Square wave (approximately) or dry contact closures at 5-25 cps as available at the output of a Quindar tone receiver.

Receiver Output

Current ranges: 0-5 ma, or —2.5 ma to +2.5 ma, or 1-5 ma into a load impedance of 3000 ohms maximum.

Accuracy: ± 0.3% maximum error including transmitter. 1% of full scale maximum error for any combination of temperature in the range of —20° to +60° C or supply voltage —5% + 10%.

Ripple: The output current to the indicating or recording device has a ripple less than 2% of full scale.

Environmental Range

Temperature: —20° C to +60° C

Humidity: up to 95%

Power Requirement

115 VAC, 10 VA; 12 VDC at 60 ma

Weight

3 pounds

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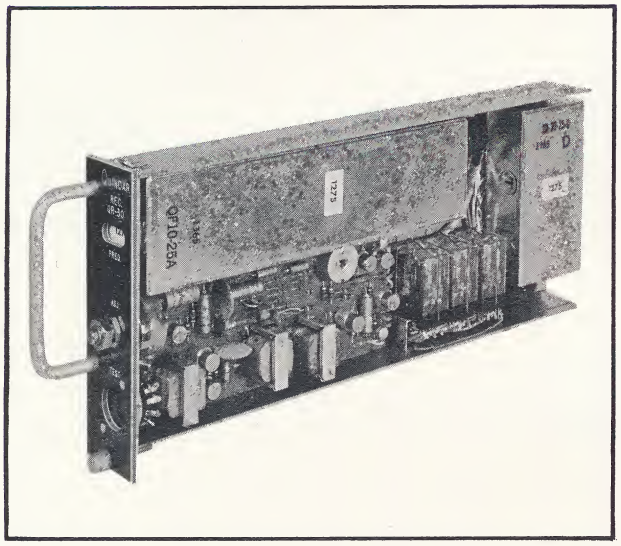
QR-30 FS TONE RECEIVER

Bulletin 1006



FEATURES

- One common type of plug-in transistor used throughout
- Front panel test socket
- Individually fused
- Screwdriver system expansion
- Interchangeability of modules and frequencies
- Economical initial and expansion costs
- 12 VDC operated
- Highly sensitive
- Single adjustment
- Wide tolerances on input power and temperature specifications
- Adjacent Mark to Space attenuation 18-20 db pulsing transient, 25-30 db steady state on 100 cps spacing

FUNCTION

The Quindar QR-30 is a transistorized frequency shift receiver. It is used to receive and detect audio tones of specific frequencies for conversion into 2-state or 3-state functional outputs. The QR-30 can be used to detect three frequencies or two frequencies; Center, Mark, or Space — or just Mark and Space. Center is the nominal channel frequency, Mark is a frequency Δf higher than Center, and Space is a frequency Δf lower than Center. Three-state operation includes such applications as open/no action/close type of control. An example of a 2-state application is the detecting of 1's and 0's of a digital code. No modification is required, regardless of whether 2-state or 3-state operation is used.

These units can be supplied to detect any center frequency from 365 to 6925 cps over telephone line pairs or other transmission media for conversion into a functional output. They are frequently used in combination with other receivers, each operating on a particular frequency to perform many functions over the same transmission circuit.

Typical applications of FS units are remote supervisory control of pumps, motors, valves, breakers—and telemetering of pressure, flows, levels, electrical quantities, etc. Most receiving functions of a Centralized Dispatching System (CDS) can be handled by these units.

DESIGN HIGHLIGHTS

The QR-30 is comprised of a highly selective bandpass filter, discriminator, amplifier and output device. The receiver filter, QF-10, and the discriminator, QD-30, determine the operating frequency of the receiver, and are incorporated as plug-in sub-modules. A telemetering adapter is used in place of relays when output voltages are required instead of contact closures.

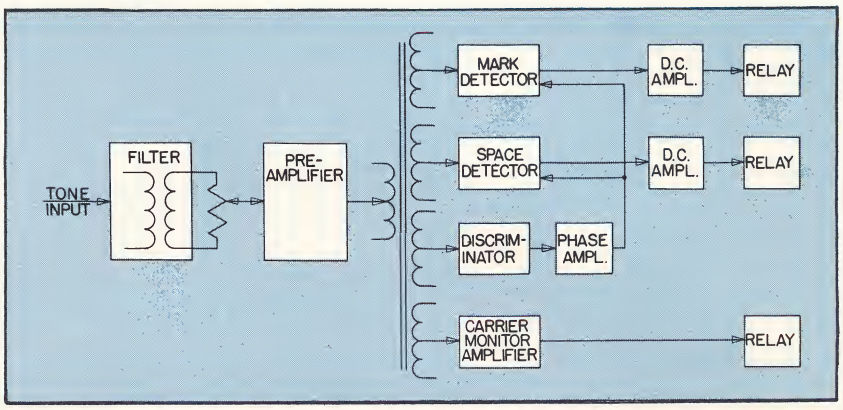
In addition to outputs for Mark, Space, and Center, the QR-30 is equipped with a Carrier Detector relay which monitors the presence of a signal within the passband of the QF-10 filter.

(Continued on Back Page)

DESIGN HIGHLIGHTS

(Continued)

All wiring is brought to the Quindar module plug which mates with a screw-type terminal block. This terminal block is furnished as a part of the QR-30, but is usually fastened to the rear of mounting frame that houses several modules.



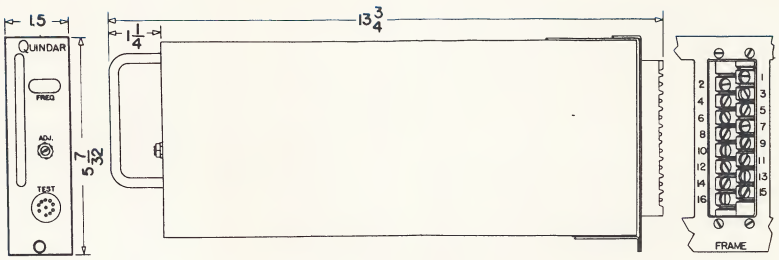
BLOCK DIAGRAM, QR-30 FS TONE RECEIVER

SPECIFICATIONS

Sensitivity:	Adjustable to –45 dbm (channel monitor set at –40 dbm)
Input Impedance:	600 ohms at center frequency with rising characteristics
Dynamic Range:	25 db
Output:	Separate relays for Mark and Space wired to provide SPDT output for Mark, SPDT for Space, and a contact closure for Center frequency plus SPDT contacts for tone channel monitor relay. All contacts rated at 5 amps, 115 VAC, 5 amps at 29 VDC.
QF-10:	**For 100 cps spacing:** 52 cps minimum at 3 db points; at least 35 db down at 100 cps above and below nominal center frequency. **For 120 cps spacing:** 62 cps minimum at 3 db points; at least 35 db down at 120 cps above and below nominal center. **For 150 cps spacing:** 66 cps minimum at 3 db points; at least 35 db down at 150 cps above and below nominal center. **For 170 cps spacing:** 86 cps minimum at 3 db points; at least 35 db down at 170 cps above and below nominal center.
Pulsing Characteristics:	30 pps maximum at 100 cps spacing; 40 pps maximum at 170 cps spacing.
Operating Temperature Range:	–30 to +60°C.
Power Required:	12 VDC ± 10%; 102 ma on receiving Center, 140 ma on receiving Mark or Space.
Weight:	5 lbs.

ORDERING INFORMATION

Specify QR-30 followed by the frequency at which the receiver will operate. Standard frequencies can be selected from those listed in Quindar General Information Bulletin 1000. Also specify output device such as: standard relay; hermetically sealed relay; QA-10, voltage adapter for up to 150 ma at 12 VDC; or, QA-11 voltage adapter for up to 45 ma at 12 VDC. See Quindar Bulletin 3001 for more information on these devices.



OUTLINE DIAGRAM, QR-30 FS TONE RECEIVER

Quindar
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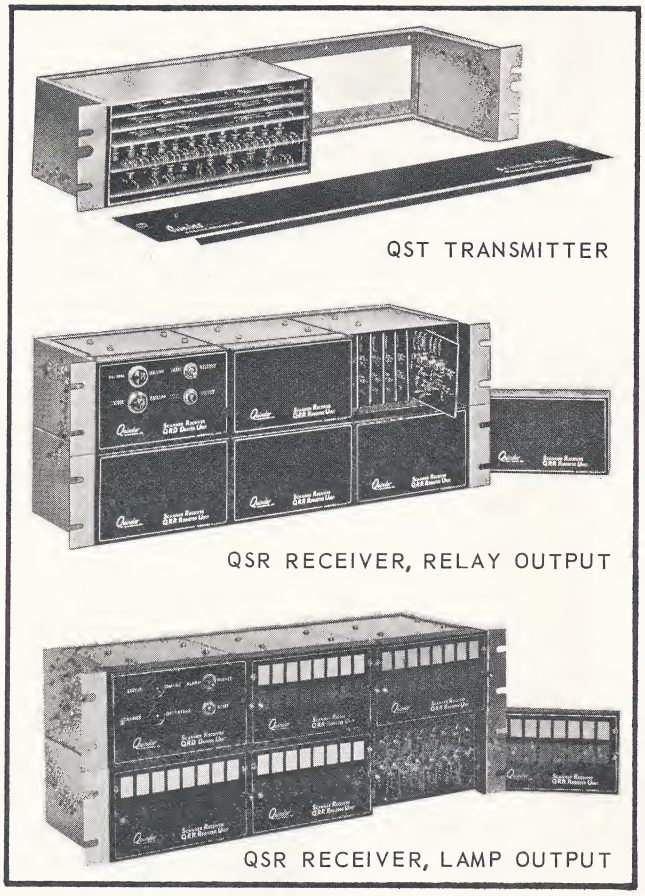
SCANNING SYSTEM
QSS-1
Bulletin 4000A



QST TRANSMITTER

QSR RECEIVER, RELAY OUTPUT

QSR RECEIVER, LAMP OUTPUT

FUNCTION

QUINDAR SCANNING SYSTEM, QSS-1

THE QSS-1 is a completely electronic, solid-state scanning system. This system economically provides a means of transmitting On-Off (binary) data over long distances for such purposes as alarm monitoring from unattended stations, digital telemetering, and remote control. An outstanding feature of the scanning system is that it permits the transmission of many bits of data over a single frequency shift tone channel, thereby improving spectrum utilization and lowering line costs.

The QSS-1 is intended for continuous operation under rigorous and demanding industrial service conditions. Reliability, long life and easy maintenance have been the criteria of design. These factors, coupled with Quindar's knowledge of the industry and practical engineering experience, have combined to provide another amazingly high quality, low cost addition to its line of electronic products for centralized control and data transmission.

FEATURES

- All solid-state
- Continuous duty
- Outstanding code checking features for high reliability
- Modular for easy expansion and simple maintenance
- Compact
- No adjustments
- One type of transistor throughout
- Automatic channel monitoring
- Can be battery operated
- Operable over wide environmental variations
- Outputs can be lamp indications or contact closures
- No change in output until code has been checked
- Operates with contact or voltage input
- Convenient test provisions

DESCRIPTION

The Quindar Scanner System consists of a Scanner Transmitter QST-XX and Scanner Receiver QSR-XX. The numbers following the letter designations refer to the system capacity which increases in multiples of 8 to 40. The Transmitter consists of a Driver Board and encoder boards which permit expansion to 40 points. The receiver consists of one Driver module and up to five Receive Registers of eight points each. A point is considered to be two-state, i.e. ON or OFF. The Receive Registers may be equipped for lamp display of two lamps per point, or for relay output.

The Scanner System is a monitoring system which continuously and sequentially samples the condition of remote switches or voltages. This information is encoded in the form of a pulse train and transmitted to the receiver unit where the information is synchronously decommutated and directed to the appropriate display or relay register. There are no timing problems of pulse width determination. A code is used in which 1's (e.g. contacts closed) are carried as plus voltages or Mark outputs from FS receivers and 0's (e.g. contacts open) are carried as negative voltages or Space outputs from FS receivers. The Quindar system transmits a synchronizing signal once each scan so there is no dependence on power line synchronization or ultra stable oscillators. The information contained in each scan is held in a shift register and is not displayed until the sweep has been completed and synchronization confirmed.

Figures 1 and 2, transmitter and receiver respectively, are block diagrams of the system showing the code employed.

Refer to Figure 1. A Timing Pulse Generator (Clock) pulses a series of binary counters. At each count, the Decoding Matrix sequentially gates either a negative or ground potential from the monitored contacts to the Mark or Space gates. The negative potential allows the square-wave clock pulses from the sync gate to pass through the Space gate, thus keying the Space frequency of an FS transmitter. The ground potential opens the Mark gate, allowing the clock pulses to key Mark frequency. When the fourth binary counter is pulsed, the sync gate is closed, preventing the passing of the corresponding clock pulse. This action results in the absence of a Mark or Space which can then be recognized as the sync signal at the receiver.

Refer to Figure 2, the Receiver. The FS receiver output is fed to the Pulse Regenerator and Separator, providing the 1's for Marks and 0's for Spaces for the Shift Register. Due to a special code checking feature the N + 1 and N + 2 stages of the shift register will always have a 1 and a 0 respectively when the sync signal is received if the code reception has been correct. Under these conditions, the information in the shift register is transferred to the output register which can be either a lamp display or relay bank. The shift register is then reset and the process repeats. If the code checking requirements are not satisfied, the shift register is reset and the process repeats without any transfer of information from the shift register to the output register.

Additional Features

GENERAL ALARM:

A general alarm lamp lights and relay contacts close upon reception of an alarm. The contacts may be used to sound an audible alarm. A toggle switch is provided which opens the alarm relay circuit without affecting the general alarm lamp display. When the fault is cleared the lamp returns to normal but the relay circuit is again completed so that the audible alarm will call the operator's attention to the fact that the alarm condition has been cleared.

CHANNEL FAILURE:

The incoming signal at the attended station is constantly monitored to check that pulses are being received. The absence of pulsing causes an alarm to be registered and *prevents any change from the last correct display.*

Pulsing speed is factory adjustable. It is usually adjusted to operate at 15 points per second for operation over a standard narrow band Frequency Shift Channel, but operation at higher speeds are available.

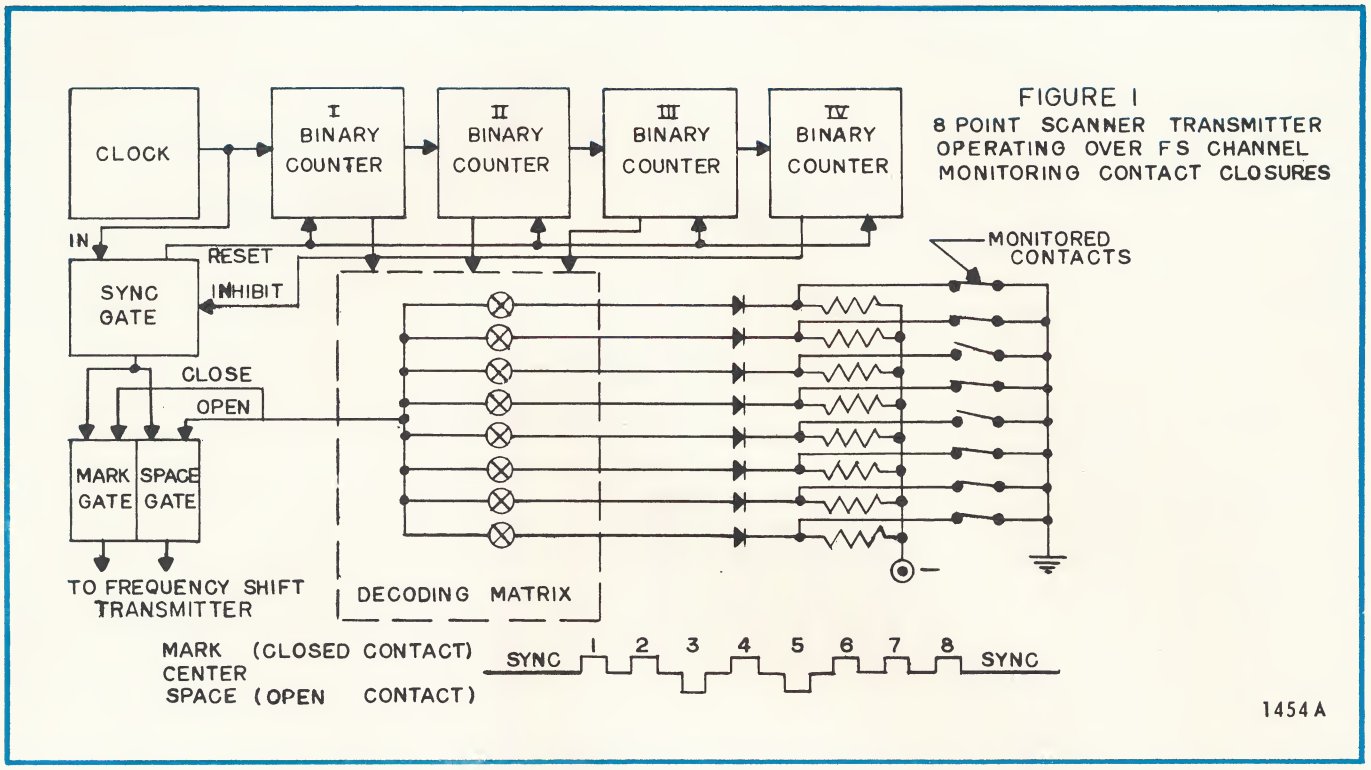


FIGURE 1
8 POINT SCANNER TRANSMITTER OPERATING OVER FS CHANNEL MONITORING CONTACT CLOSURES

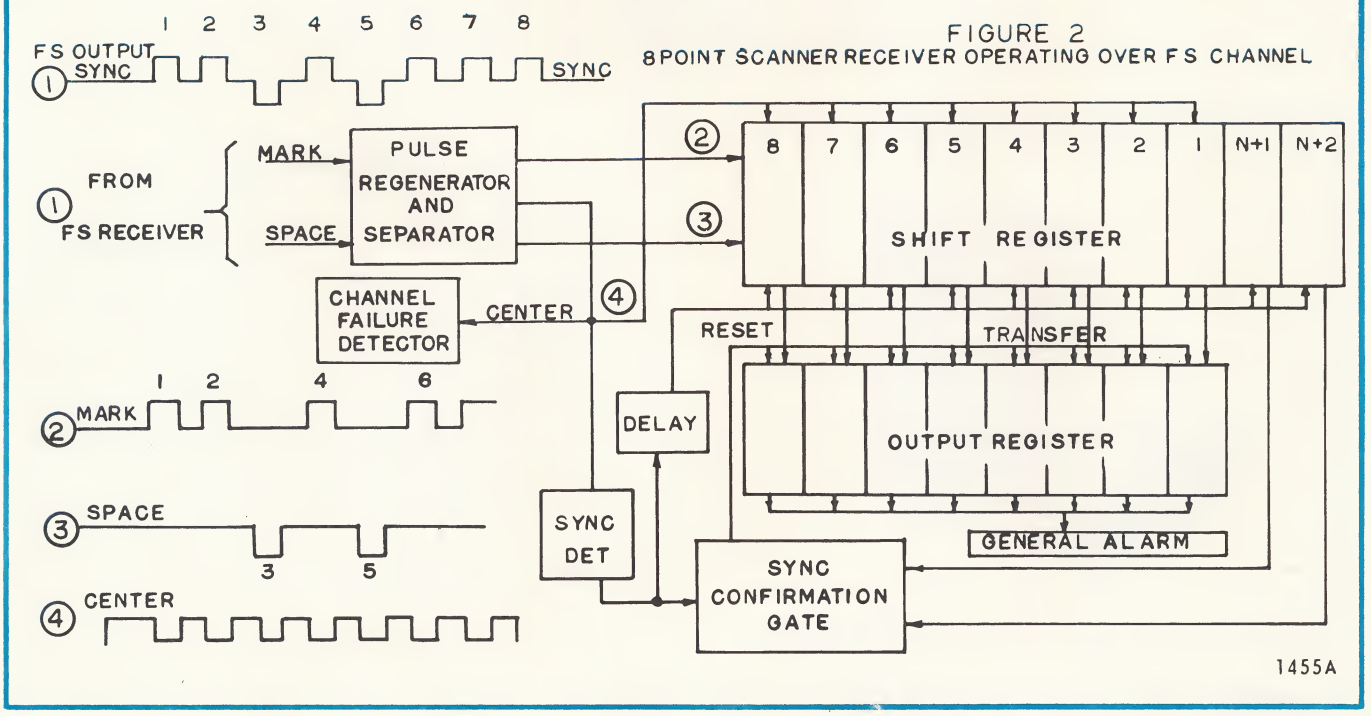
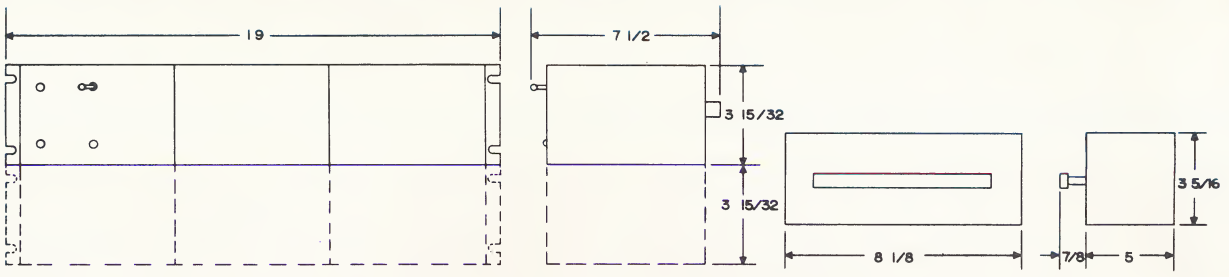


FIGURE 2
8 POINT SCANNER RECEIVER OPERATING OVER FS CHANNEL



QSR, SCANNER RECEIVER WITH LAMP INDICATOR
(16 POINTS + 24 ADDITIONAL POINTS SHOWN DOTTED)
NOTE: ADDITIONAL SPACE IS REQUIRED FOR FRONT MOUNTED RELAYS.

QST, SCANNER TRANSMITTER
(SAME FOR 8-40 POINTS)

OUTLINE DRAWING

SPECIFICATIONS

SYSTEM	**Speed of operation:**	Normally provided at 15 pps but speeds up to 1000 pps can be supplied.
	Temperature:	—30°C to +60°C.
	Number of points:	8, 16, 24, 32, or 40. Larger systems are also available.
TRANSMITTER	**Input:**	Dry contact closures or voltages.
	Output:	Driving voltages for Quindar F.S. tone transmitters.
	Power Required:	12 VDC, 70 ma.
RECEIVER	**Input:**	Output from QR-30 F.S. receiver equipped with QA-30 adapters.
	Output:	With QSR-L, two lamps per point; With QSR-R, one form C per point; With QSR-RK or QSR-RKH, two form C per point. Relay contacts per point rated at 5 amps at 29 VDC or 115 VAC resistive.
	Power Required:	12 VDC 2A. for 40 points with 2 lamps or relay output.

ORDERING INFORMATION

TRANSMITTER: QST — followed by the number of points desired: 8, 16, 24, 32, or 40 for dry contact monitoring. If no other source of 12 VDC is available, order QP-3. (Note that if a Quindar Tone Unit power supply is available, it can be used to power the QST.)

RECEIVER: QSR-XX-X. Where the first two XX's are the number of points desired: 8, 16, 24, 32, or 40 and the last X should be one of the following:

L for two lamps per point output
R for relay output with relays mounted on rear of QSR
RK for relays mounted on eight-relay strips (1¾ x 19 inches) below QSR
RKH same as RK except relays are hermetically sealed.

If no other source of 12 VDC is available order 1 QP-20, 2.5 amp, 12 VDC power supplies.

QSM-30 SCANNER TEST SET

DESCRIPTION

The QSM-30 Scanner Test Set facilitates rapid and accurate checking of Quindar QSS-1 Scanner Systems. Its use permits troubleshooting by non-technical personnel, as well as speeding the location of trouble by experienced technicians.

A single four-position selector switch and a variable control on the test set front panel determine the function to be checked, and a convenient engraved chart on the side of the meter specifies the proper indication for each check.

Order as QSM-30 Scanner Test Set.

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Printed in U.S.A.